REMARKS

The Examiner has objected to the title of the invention as being non-descriptive. As suggested by the Examiner, the title of the invention is being amended throughout the application to read **"Method for Inspecting Channel Pipes Utilizing Digital Images Taken With a Fish-Eye Lens."** Amendments to the specification and abstract are submitted herewith to obviate Examiner's requirement for a new title.

The Examiner has rejected Claims 4-6 under 35 U.S.C. 103(a) as being unpatentable over Peleg et al (WO 98/34195) over Shirato et al (WO/2002/019270). This rejection is respectfully traversed.

With respect to Claim 4, Peleg et al discloses a method of generating panoramic mosaics from multiple individual one-point perspective video frames by projecting multiple strips, taken from each individual video frame and approximately perpendicular to the optical flow, projecting them onto a cylindrical surface such that the optical flow becomes parallel and pasting them to a panoramic mosaic.

Shirato et al discloses the conversion of a curved image into a plane image by projecting a fish-eye lens image onto a sphere and viewing the inside of the sphere from a virtual camera at the center of the sphere (cf. par [0050]), wherein

the camera in the center can point into the sphere at various angles to output multiple perspective views.

Peleg et al merely provides a way to combine multiple frames to a panoramic mosaic. To correct perspective errors, the multiple one-point perspective images have to be projected on a cylinder and, thereby, get distorted (although the final image would seem non-distorted again; but, however, does not involve a non-distorted central perspective view.)

Shirato et al merely provides a fast way of calculating a one-point perspective image from a single distorted image. It is pointed out that Shirato et al does not extend beyond the disclosure of US 5,185,667, which has been mentioned in the present application as state of the art. Particularly, it is stated in the introductory part of the present application:

> *"US 5,185,667 discloses a method for producing perspective images with swiveling, tilting, rotating, and magnification functions from digital images produced with a fisheye lens and permitting an observation of the images taken at the shooting point in different directions, but only as from said point."*

Having this in mind, it is further pointed out that in the disclosures cited by the Examiner it is not mentioned that a fictive view can be calculated from a single image for a point at which the camera, which has captured the image, has not been

positioned. To allow such a procedure the geometry of the room (or object) in which the image has been taken, has to be taken into account. However, this has not been taken into consideration in the cited documents because it simply was not necessary.

The Examiner's assertion that Shirato shows a fictive camera position is not true. Shirato shows multiple cameras at the same position, such as the center of the sphere pointing in different directions at different angles. The position of the camera in the sphere corresponds to the optical center of the image, such as the position of the real camera which has captured the image.

In the present invention, a fish-eye lens image is projected to the known geometry of the pipe as given by the object captured, and then a plane image is calculated as seen from a camera position which is different from the position at which the fish-eye lens image has been captured.

Since the so called "intermediate image" is calculated from a camera position which is different from the position of the camera at which the original image has been captured, it is necessary to project the original image on a virtual pipe with the same dimensions as the real pipe in which the fish-eye lens image has been taken.

Therefore, a distorted image is captured and provides a non-distorted one-point image from the original position of the camera. Further, and in contrast to Peleg et al and Shirato et al, it is possible to fictively move the camera in the virtual space of the distorted image and calculate an "intermediate image" from a fictive position at which the real camera has not been at all.

Taking Peleg et al and Shirato et al together and considering them as a whole, they do not make Applicant's method of Claim 4 obvious within the meaning of 35 U.S.C. 103(a). Therefore, the rejection of Claim 4 should be withdrawn.

The Claim 5 method depends from Claim 4 and is patentable for the same reason as Claim 4. In addition, the method of Claim 5 sets the calculation of a corresponding image point in 3D space P on the pipe surface which is not contemplated by the two cited art references. For this reason, the cited references fail to make Claim 5 obvious within the meaning of 35 U.S.C. 103(a). Therefore, the rejection of Claim 5 should be withdrawn.

Claim 6 depends from Claim 4 and is patentable for the same reasons set forth above for Claim 4. In addition, the references cited fail to disclose calculating from the desired

fictive camera position, and its viewing angle in space, a single image point located in a desired section of an image plane used to calculate corresponding image point coordinates on an inner surface of the pipe. For this reason, the cited references fail to make Claim 6 obvious within the meaning of 35 U.S.C. 103(a). Therefore, the rejection of Claim 6 should be withdrawn.

Taking all the above in consideration, it is believed that Claims 4-6 are in condition for allowance. Such action is earnestly solicited.

Respectfully submitted,

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